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**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED  
STATION ON PRICKLY PEAR CREEK,  
JEFFERSON COUNTY, MONTANA**

June 19, 2001

**A report to  
the Montana Department of Environmental Quality  
Helena, Montana**

**by**  
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## INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Prickly Pear Creek near Clancy, Montana on June 19, 2001. The sample site was located by GPS reading at 46° 30' 58" N, 111° 56' 52" W, lying within the Northern Rockies Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. For example, 24 of the riverine or high-order waterways sampled for the fixed station study were located within Western Montana ecoregions and were sampled between July 23 and August 25, 2001. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Ninety-eight sites from Western Montana were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures; impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

## RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored sub-optimally. Instream habitat was judged to be limited by moderate sediment deposition; embeddedness of substrate particles was noted, and benthic substrate diversity was appraised as somewhat monotonous. Some channelization was observed. Streambank stability was perceived to be a big problem at this site; conditions were judged marginal or poor. Bank vegetative cover was also limited. The riparian zone width was judged marginal.

**Table 1.** Stream and riparian habitat assessment for a fixed station on Prickly Pear Creek, June 2001.

Max. possible score	Parameter	Prickly Pear Creek near Clancy
10	Riffle development	9
10	Benthic substrate	7
20	Embeddedness	13
20	Channel alteration	13
20	Sediment deposition	9
20	Channel flow status	19
20	Bank stability: left / right	1 / 5
20	Bank vegetation: left / right	3 / 8
20	Vegetated zone: left / right	3 / 5
160	Total	95
	Percent of maximum CONDITION*	<b>59</b> <b>SUB-OPTIMAL</b>

\*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

**Table 2.** Metric values, scores, and bioassessment for a fixed station on Prickly Pear Creek. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. June 2001.

	Prickly Pear Creek near Clancy	
METRICS	METRIC VALUES	METRIC SCORES
Ephemeroptera richness	4	2
Plecoptera richness	2	2
Trichoptera richness	9	3
Number of sensitive taxa	1	1
Percent filterers	3.7	3
Percent tolerant taxa	27.2	1
	TOTAL SCORE (max.=18)	12
	PERCENT OF MAX.	67
	Impairment classification	SLIGHT
	USE SUPPORT	PARTIAL

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on Prickly Pear Creek is slightly impaired and only partially supports designated uses.

The low biotic index value (2.88) suggests that water quality was essentially unimpaired at this site, though mayfly taxa richness, which is another indicator of water quality, was somewhat lower than expected. Fine sediment indicators in the data also gave equivocal results; although 16 “clinger” taxa and 9 caddisfly taxa were collected in the sample, animals preferring fine sediments accounted for 9% of organisms present.

Contradictory signals in benthic community metrics can signal variable conditions within a site, such as slow-flowing areas with sediment deposition and a thalweg of limited area, which is able to support assemblages preferring clean substrates.

All functional components characteristic of a mid-order montane stream were present in the sample. The contribution of shredder taxa was particularly high, suggesting that riparian inputs of large organic material were ample, and that flow conditions favored the retention of such material.

The presence of *Protanhyderus* sp. suggests that some sandy substrates were available at the site.

## CONCLUSIONS

- Some fine sediment deposition appears to have been present at the site, although areas of clean substrates were indicated as well, suggesting that both slack or low flow areas as well as fast moving waters were sampled.
- Water quality indicators gave contradictory results, but the taxonomic composition of the sample suggests that water quality was good.
- Taxonomic composition and tolerance characteristics of the benthic assemblage appear to agree with the impairment classification assigned to the site by the bioassessment method used.

## LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft. April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia. US Geological Survey.

## **APPENDIX**

### **Taxonomic data and summaries**

#### **Prickly Pear Creek**

**June 2001**

# Aquatic Invertebrate Taxonomic Data

Site Name: Prickly Pear Creek near Clancy

Date: 6/19/01

Site ID: M09PRPEC01

Approx. percent of sample used 97

Taxon	Quantity	Percent	HBI	FFG
Nematoda	2	0.62	11	PA
<i>Pisidium</i> sp.	5	1.55	8	CF
<i>Acari</i>	1	0.31	5	PA
<b>Total Misc. Taxa</b>	<b>8</b>	<b>2.48</b>		
<i>Octogomphus</i> sp.	1	0.31	4	PR
<b>Total Odonata</b>	<b>1</b>	<b>0.31</b>		
<i>Acentrella turbida</i>	13	4.02	4	CG
<i>Diphetor hageni</i>	1	0.31	5	CG
<i>Drunella flavilinea</i>	39	12.07	2	CG
<i>Tricorythodes minutus</i>	1	0.31	4	CG
<b>Total Ephemeroptera</b>	<b>54</b>	<b>16.72</b>		
<i>Pteronarcella badia</i>	1	0.31	0	SH
<i>Pteronarcys californica</i>	15	4.64	1	SH
<b>Total Plecoptera</b>	<b>16</b>	<b>4.95</b>		
<i>Arctopsyche grandis</i>	1	0.31	2	PR
<i>Amiocentrus</i> sp.	4	1.24	3	CG
<i>Brachycentrus americanus</i>	3	0.93	1	CF
<i>Micrasema</i> sp.	1	0.31	1	SH
<i>Glossosoma</i> sp.	1	0.31	0	SC
<i>Helicopsyche borealis</i>	50	15.48	3	SC
<i>Lepidostoma</i> sp.-saud case larvae	74	22.91	1	SH
<i>Oecetis</i> sp.	2	0.62	8	PR
<i>Rhyacophila Coloradensis</i> Gr.	1	0.31	2	PR
<b>Total Trichoptera</b>	<b>137</b>	<b>42.41</b>		
<i>Cleptelmis</i> sp.	1	0.31	4	CG
<i>Narpus</i> sp.	3	0.93	2	CG
<i>Optioservus</i> sp.	34	10.53	5	SC
<b>Total Coleoptera</b>	<b>38</b>	<b>11.76</b>		
<i>Atherix</i> sp.	8	2.48	4	PR
<i>Simulium</i> sp.	4	1.24	5	CF
<i>Protanyderus</i> sp.	1	0.31	1	UN
<i>Antocha</i> sp.	25	7.74	3	CG
<i>Hexatoma</i> sp.	3	0.93	2	PR
<b>Total Diptera</b>	<b>41</b>	<b>12.69</b>		
<i>Eukiefferiella Gracei</i> Gr.	3	0.93	8	CG
<i>Pagastia</i> sp.	7	2.17	1	CG
<i>Polypedium</i> sp.	10	3.10	6	SH
<i>Tvetenia</i> sp.	8	2.48	5	CG
<b>Total Chironomidae</b>	<b>28</b>	<b>8.67</b>		
<b>Grand Total</b>	<b>323</b>	<b>100.00</b>		

# Aquatic Invertebrate Summary

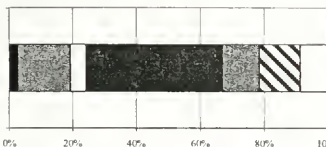
## Site Name:

Date:

SAMPLE TOTAL	323
EPT abundance	207
TAXA RICHNESS	31
Number EPT taxa	15
Percent EPT	64.09

## TAXONOMIC COMPOSITION

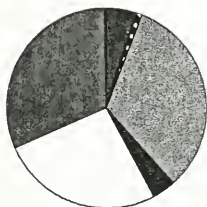
GROUP	PERCENT	#TAXA	ABUNDANCE
Misc. Taxa	2.48	3	8
Odonata	0.31	1	1
Ephemeroptera	16.72	4	54
Plecoptera	4.95	2	16
Hemiptera	0.00	0	0
Megaloptera	0.00	0	0
Trichoptera	42.41	9	137
Lepidoptera	0.00	0	0
Coleoptera	11.76	3	38
Diptera	12.69	5	41
Chironomidae	8.67	4	28



- Misc. Taxa
- Odonata
- ▨ Ephemeroptera
- ▩ Plecoptera
- Hemiptera
- ▨ Megaloptera
- ▩ Trichoptera
- ▩ Lepidoptera
- ▩ Coleoptera
- Diptera
- Chironomidae

## FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	4.95	6	16
Parasite	0.93	2	3
Gatherer	32.51	11	105
Filterer	3.72	3	12
Herbivore	0.00	0	0
Piercer	0.00	0	0
Scraper	26.32	3	85
Shredder	31.27	5	101
Xylophage	0.00	0	0
Omnivore	0.00	0	0
Unknown	0.31	1	1



- Predator
- Parasite
- ▨ Gatherer
- ▨ Filterer
- ▨ Herbivore
- ▨ Piercer
- ▨ Scraper
- ▨ Shredder
- ▨ Xylophage
- ▨ Omnivore
- ▨ Unknown

## COMMUNITY-TOLERANCES

Sediment tolerant taxa	4
Percent sediment tolerant	9.29
Sediment sensitive taxa	2
Percent sediment sensitive	0.62
Metals tolerance index (McGuire)	3.65
Cold stenotherm taxa	1
Percent cold stenotherms	0.31

## Site ID:

TAXON	ABUNDANCE	PERCENT
<i>Lepidostoma</i> sp.-sand case larva	74	22.91
<i>Helicophyche borealis</i>	50	15.48
<i>Drumella flavilinea</i>	39	12.07
<i>Optoservus</i> sp.	34	10.53
<i>Anischa</i> sp.	25	7.74
SUBTOTAL 5 DOMINANTS	222	68.73
<i>Pteronarcys californica</i>	15	4.64
<i>Acanthella nurbia</i>	13	4.02
<i>Polypedilum</i> sp.	10	3.10
<i>Atheris</i> sp.	8	2.48
<i>Tvetenia</i> sp.	8	2.48
TOTAL DOMINANTS	276	85.45

## SAPROBITY

Hilsenhoff Biotic Index	2.88
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## DIVERSITY

Shannon H (log)	2.21
Shannon H (log2)	3.19
Simpson D	0.10

## VOLTINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	35	10.68
Univoltine	229	70.90
Semivoltine	60	18.42

## TAXA CHARACTERS

TOLERANT	#TAXA	ABUNDANCE	PERCENT
Tolerant	5	88	27.24
Intolerant	1	1	0.31
Clinger	16	193	59.75

## BIODIVERSITY INDICES

METRIC	VALUE	SCORE
Taxa richness	31	3
E richness	4	1
P richness	2	1
T richness	9	3
Long-lived	5	5
Sensitive richness	1	1
%tolerant	27.24	3
%predators	4.95	1
Clinger richness	16	3
%dominance (3)	50.46	3
TOTAL SCORE		24

48 %

## MONTANA DEQ METRICS (Bukantus 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	31	3	3	3
EPT richness	15	3	3	1
Biotic Index	2.88	3	3	3
%Dominant taxon	22.91	3	3	3
%Collectors	36.22	3	3	3
%EPT	64.09	3	3	2
Shannon Diversity	3.19	3	3	3
%Scrapers + Shredd	57.59	3	3	3
Predator taxa	6	3	3	3
%Autovoltine	10.68	3	3	3
%H of T	0	3	3	3
TOTAL SCORES		30	24	18
PERCENT OF MAXIMUM		100.00	100.00	85.71
IMPAIRMENT CLASS		NON	NON	NON

## Montana DEQ metric bar chart

